

CLAIMS

What is claimed is:

1 1. A power generation system, comprising:
2 a fuel source to provide fuel;
3 a turbogenerator, coupled to the fuel source, to generate AC power;
4 a power controller, coupled to the turbogenerator, including an AC/DC
5 power converter, said AC/DC power converter to convert said AC power generated
6 by the turbogenerator to DC power on output lines to supply a DC load, said power
7 controller to regulate the fuel to the turbogenerator, independent of a DC voltage on
8 the output lines; and
9 a capacitor coupled across the output lines, said capacitor to source power to
10 and/or sink power from the output lines, due to load changes by the DC load, to
11 stabilize a DC voltage on the output lines.

1 2. The power generation system of claim 1 wherein the capacitor
2 comprises at least one of the following: an electrochemical capacitor and a hybrid
3 capacitor.

1 3. The power generation system of claim 2 wherein a voltage range of the
2 capacitor is limited to a predetermined voltage range.

1 4. The power generation system of claim 1 wherein the capacitor is
 2 located internal to the power controller.

1 5. The power generation system of claim 1 wherein when an increase in
 2 the load is detected, the power controller increases the fuel to the turbogenerator to
 3 increase the DC power on the output lines.

1 6. The power generation system of claim 5 wherein when the DC power
 2 on the output lines is sufficient to match the increase in the load and recharge the
 3 capacitor, said power controller to reduce the fuel to the turbogenerator to match the
 4 load required by the DC load.

1 7. The power generation system of claim 1 wherein when a decrease in
 2 the load is detected, the power controller decreases the fuel to the turbogenerator to
 3 decrease the DC power on the output lines to match the load required by the DC
 4 load.

1 8. The power generation system of claim 1 wherein the turbogenerator
 2 includes a motor/generator and said AC/DC power converter comprises a bi-
 3 directional AC/DC power converter, said power controller, in a startup mode, to
 4 configure the bi-directional AC/DC power converter in a reverse direction to
 5 convert DC power of the capacitor to AC power to power the motor/generator.

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1 9. The power generation system of claim 1 further comprising a battery
2 controllably coupled across the output lines, under control of the power controller,
3 to charge the capacitor.

1 10. The power generation system of claim 1 wherein the turbogenerator
2 comprises:

3 a shaft;

4 a generator, coupled to the shaft, to generate the AC power;

5 a compressor, coupled to the shaft, to provide a supply of compressed air;

6 a combustor coupled to receive the supply of compressed air and the fuel,

7 said combustor to combust the fuel and to provide exhaust gas;

8 a turbine coupled the shaft and coupled to receive the exhaust gas, said

9 exhaust gas to flow through the turbine to control a rotational speed of the shaft;

10 and

11 a recuperator including a high pressure side coupled between the compressor

12 and the combustor, and a low pressure side coupled to receive the exhaust gas from

13 the turbine.

1 11. The power generation system of claim 10 further comprising a
2 temperature sensor coupled to the power controller and the turbine to sense a
3 temperature, said power controller to vary the supply of fuel to the combustor to
4 control the temperature, said control of the temperature being independent of the
5 DC voltage on the output lines.

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1 12. A power generation system, comprising:

2 a fuel source to provide fuel;

3 a turbogenerator, coupled to the fuel source, to generate AC power;

4 a power controller, coupled to the turbogenerator, including an AC/DC

5 power converter and a DC/DC power converter, said AC/DC power converter to

6 convert said AC power generated by the turbogenerator to DC power on a DC bus,

7 said DC/DC power converter to convert the DC power on the DC bus to an output

8 DC power on output lines to supply a DC load, said power controller to regulate the

9 fuel to the turbogenerator, independent of a DC voltage on the DC bus; and

10 a capacitor coupled across the output lines, said capacitor to source power to

11 and/or sink power from the output lines, due to load changes by the DC load.

1 13. The power generation system of claim 12 wherein the capacitor

2 comprises at least one of the following: an electrochemical capacitor and a hybrid

3 capacitor.

1 14. The power generation system of claim 12 wherein a voltage range of

2 the capacitor is limited to a predetermined voltage range.

1 15. The power generation system of claim 12 wherein the capacitor is

2 located internal to the power controller.

1 16. The power generation system of claim 12 wherein when an increase in
2 the load is detected, the power controller increases the fuel to the turbogenerator to
3 increase the output DC power on the output lines.

1 17. The power generation system of claim 16 wherein when the output DC
2 power on the output lines is sufficient to match the increase in the load and recharge
3 the capacitor, said power controller to reduce the fuel to the turbogenerator to match
4 the load required by the DC load.

1 18. The power generation system of claim 12 wherein when a decrease in
2 the load is detected, the power controller decreases the fuel to the turbogenerator to
3 decrease the output DC power on the output lines to match the load required by the
4 DC load.

1 19. The power generation system of claim 12 wherein the turbogenerator
2 includes a motor/generator and said AC/DC power converter and said DC/DC
3 power converter comprise a bi-directional AC/DC power converter and a bi-
4 directional DC/DC power converter, respectively, said power controller, in a
5 startup mode, to configure the bi-directional AC/DC power converter and the bi-
6 directional DC/DC power converter in a reverse direction to convert DC power of
7 the capacitor to AC power to power the motor/generator.

1 20. The power generation system of claim 12 further comprising a battery
2 controllably coupled across the output lines, under control of the power controller,
3 to charge the capacitor.

1 21. The power generation system of claim 12 wherein the turbogenerator
2 comprises:

3 a shaft;

4 a generator, coupled to the shaft, to generate the AC power;

5 a compressor, coupled to the shaft, to provide a supply of compressed air;

6 a combustor coupled to receive the supply of compressed air and the fuel,
7 said combustor to combust the fuel and to provide exhaust gas;

8 a turbine coupled the shaft and coupled to receive the exhaust gas, said
9 exhaust gas to flow through the turbine to control a rotational speed of the shaft;

10 and

11 a recuperator including a high pressure side coupled between the compressor
12 and the combustor, and a low pressure side coupled to receive the exhaust gas from
13 the turbine.

1 22. The power generation system of claim 21 further comprising a
2 temperature sensor coupled to the power controller and the turbine to sense a
3 temperature, said power controller to vary the supply of fuel to the combustor to
4 control the temperature, said control of the temperature being independent of the
5 DC voltage on the DC bus.

1 23. A power generation system, comprising:
2 a fuel source to provide fuel;
3 a turbogenerator, coupled to the fuel source, to generate AC power;
4 a power controller, coupled to the turbogenerator, including an AC/DC
5 power converter and a first DC/DC power converter, said AC/DC power converter
6 to convert said AC power generated by the turbogenerator to DC power on a DC
7 bus, said first DC/DC power converter to convert the DC power on the DC bus to
8 an output DC power on output lines to supply a DC load, said power controller to
9 regulate the fuel to the turbogenerator, independent of a DC voltage on the DC bus;
10 and
11 a capacitor controllably coupled, under control of the power controller, across
12 the DC bus via a second DC/DC power converter to source power to and/or sink
13 power from the DC bus, due to load changes by the DC load.

1 24. The power generation system of claim 23 wherein the capacitor
2 comprises at least one of the following: an electrochemical capacitor and a hybrid
3 capacitor.

1 25. The power generation system of claim 23 wherein the second DC/DC
2 power converter steps up a terminal voltage of the capacitor to match the DC
3 voltage on the DC bus.

1 26. The power generation system of claim 23 wherein at least one of the
2 capacitor and the second DC/DC power converter is located internal to the power
3 controller.

1 27. The power generation system of claim 23 wherein when an increase in
2 the load is detected, the power controller increases the fuel to the turbogenerator to
3 increase the DC power on the DC bus.

1 28. The power generation system of claim 27 wherein when the DC power
2 on the DC bus is sufficient to match the increase in the load and recharge the
3 capacitor, said power controller to reduce the fuel to the turbogenerator to match the
4 load required by the DC load.

1 29. The power generation system of claim 23 wherein when a decrease in
2 the load is detected, the power controller decreases the fuel to the turbogenerator to
3 decrease the DC power on the DC bus to match the load required by the DC load.

1 30. The power generation system of claim 23 wherein the turbogenerator
2 includes a motor/generator and said AC/DC power converter is bi-directional, said
3 power controller, in a startup mode, to configure the AC/DC power converter in a
4 reverse direction and the second DC/DC power converter in a forward direction to
5 convert DC power of the capacitor to AC power to power the motor/generator.

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1 31. The power generation system of claim 23 further comprising a battery
2 controllably coupled across the capacitor, under control of the power controller, to
3 charge the capacitor.

1 32. The power generation system of claim 23 wherein the turbogenerator
2 comprises:
3 a shaft;
4 a generator, coupled to the shaft, to generate the AC power;
5 a compressor, coupled to the shaft, to provide a supply of compressed air;
6 a combustor coupled to receive the supply of compressed air and the fuel,
7 said combustor to combust the fuel and to provide exhaust gas;
8 a turbine coupled the shaft and coupled to receive the exhaust gas, said
9 exhaust gas to flow through the turbine to control a rotational speed of the shaft;
10 and
11 a recuperator including a high pressure side coupled between the compressor
12 and the combustor, and a low pressure side coupled to receive the exhaust gas from
13 the turbine.

1 33. The power generation system of claim 32 further comprising a
2 temperature sensor coupled to the power controller and the turbine to sense a
3 temperature, said power controller to vary the supply of fuel to the combustor to
4 control the temperature, said control of the temperature being independent of the
5 DC voltage on the DC bus.

1 34. A power generation system, comprising:
2 a turbogenerator including a motor/generator and a turbine, said
3 turbogenerator to generate AC power; and
4 a power controller, coupled to the turbogenerator, including an AC/DC
5 power converter and a capacitor, said AC/DC power converter to convert said AC
6 power generated by the turbogenerator to DC power on output lines to supply a DC
7 load, said capacitor coupled across the output lines to source power to and/or sink
8 power from the output lines due to load changes, said power controller to regulate a
9 speed of the turbine, independent of a DC voltage on the output lines.

1 35. The power generation system of claim 34 wherein the capacitor is at
2 least one of an electrochemical capacitor and a hybrid capacitor.

1 36. The power generation system of claim 34 wherein the AC/DC power
2 converter comprises a bi-directional AC/DC power converter, said power
3 controller, in a startup mode, to configure the bi-directional AC/DC power
4 converter in a reverse direction to convert DC power of the capacitor to AC power
5 to power the motor/generator.

1 37. The power generation system of claim 34 further comprising a battery
2 controllably coupled across the output lines, under control of the power controller,
3 to charge the capacitor.

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1 38. A power generation system, comprising:
2 a turbogenerator including a motor/generator and a turbine, said
3 turbogenerator to generate AC power; and
4 a power controller, coupled to the turbogenerator, including an AC/DC
5 power converter, a DC/DC power converter, and a capacitor, said AC/DC power
6 converter to convert said AC power generated by the turbogenerator to DC power
7 on a DC bus, said DC/DC power converter to convert the DC power on the DC bus
8 to an output DC power on output lines to supply a DC load, said capacitor coupled
9 across the output lines to source power to and/or sink power from the output lines,
10 due to load changes by the DC load, said power controller to regulate a speed of the
11 turbine, independent of a DC voltage on the DC bus.

1 39. The power generation system of claim 38 wherein the capacitor
2 comprises at least one of the following: an electrochemical capacitor and a hybrid
3 capacitor.

1 40. The power generation system of claim 38 wherein the AC/DC power
2 converter and said DC/DC power converter comprise a bi-directional AC/DC
3 power converter and a bi-directional DC/DC power converter, respectively, said
4 power controller, in a startup mode, to configure the bi-directional AC/DC power
5 converter and the bi-directional DC/DC power converter in a reverse direction to
6 pass energy stored by the capacitor to start the motor/generator.

1 41. The power generation system of claim 38 further comprising a battery
2 controllably coupled across the output lines, under control of the power controller,
3 to charge the capacitor.

1 42. A power generation system, comprising:
2 a turbogenerator including a motor/generator and a turbine, said
3 turbogenerator to generate AC power; and
4 a power controller, coupled to the turbogenerator, including an AC/DC
5 power converter, first and second DC/DC power converters, and a capacitor, said
6 AC/DC power converter to convert said AC power generated by the turbogenerator
7 to DC power on a DC bus, said first DC/DC power converter to convert the DC
8 power on the DC bus to an output DC power on output lines to supply a DC load,
9 said capacitor controllably coupled across the DC bus via the second DC/DC power
10 converter, under control of the power controller, to source power to and/or sink
11 power from the DC bus due to load changes by the DC load, said power controller
12 to regulate a speed of the turbine, independent of a DC voltage on the DC bus.

1 43. The power generation system of claim 42 wherein the capacitor
2 comprises at least one of the following: an electrochemical capacitor and a hybrid
3 capacitor.

1 44. The power generation system of claim 42 wherein the AC/DC power
2 converter is bi-directional, said power controller, in a startup mode, to configure the
3 AC/DC power converter in a reverse direction and the second DC/DC power

- 4 converter in a forward direction to pass energy stored by the capacitor to power the
- 5 motor/generator.

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